

relative to the ReSound baseline with foam covering and that it has a more robust, streamlined shape that lends itself to unobtrusive operation by the user. Microphone response was carefully correlated with flow parameters such as turbulence, airspeed, and flow angle so that future changes can be evaluated using the database.

Further improvements in the design may be possible by optimizing the screen impedance and the forebody shape.

Points of Contact: C. Horne/ P. Soderman
(650) 604-4571/6675
chorne@mail.arc.nasa.gov
psoderman@mail.arc.nasa.gov

Stealth Technology Reduces Airframe Noise

Paul T. Soderman

Recent airframe noise studies at Ames Research Center and elsewhere have identified flap side-edge noise as an important component of aircraft landing noise. During aerodynamic tests of an Air Force stealth fighter design (called SHARC) in the Ames 40- by 80-Foot Wind Tunnel, it came to our attention that stealth technology might have acoustic attributes. Specifically, the Continuous Moldline Technology (CMT) developed for SHARC eliminates flap side edges by blending the flap and wing trailing edges with a flexible material that is load bearing. This led to a 7- by 10-foot wind tunnel aeroacoustic test of a two-dimensional airfoil with a simple hinged flap with and without a CMT modification (figure 1).

To investigate CMT performance, a 70-element phased microphone array technology (PMAT) acoustic system was installed in the Ames 7- by 10-Foot Wind Tunnel test section wall. The array is designed for visualization of noise sources and determination of their individual strengths. Noise radiation from the vertically mounted wing/flap model revealed a virtual elimination of the side-edge

noise in the flyover direction. Because of the large noise reduction, it was necessary to recess the microphones in order to reduce flow-induced noise and increase the signal-to-noise ratio. A strong Kevlar cloth covered the recess. With this array geometry, noise levels that were 20 decibels below the wind tunnel background noise could be identified.

With the new array, it was found that the CMT flap was at least 6–8 decibels quieter than the simple hinged flap, as shown by the phased array images of figure 2. Background noise made it impossible to identify noise sources below that level. Previous work indicates that the simple hinged flap is quieter than the conventional Fowler flap used on current air transports. Hence, new aircraft designs such as the Blended Wing Body, which can operate with a simple high lift system, would benefit from the low noise of simple hinged or CMT flap systems. Aerodynamic performance data were acquired simultaneously with the acoustic data.

Point of Contact: P. Soderman
(650) 604-6675
psoderman@mail.arc.nasa.gov

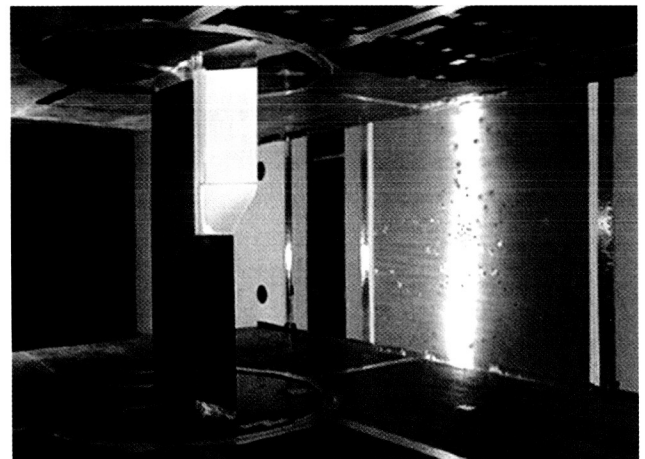


Fig. 1. Upstream view of airfoil model with simple flap (upper white) blended to wing by CMT section. Phased microphone array is mounted on test section right wall.